

# THYROIDECTOMY

## Types:

- \* **Enucleation** = excision of affected nodule (without devascularization). Obsolete.!
- \* **Partial thyroidectomy** = excision of both lobes & isthmus, leaving postero-medial part of each lobe equal to normal lobe (size of distal phalanx) to protect RLN & parathyroid glands ...
- \* **Subtotal thyroidectomy** = excision of both lobes & isthmus, leaving postero-medial part of each lobe equal to  $\frac{1}{2}$  or  $\frac{1}{3}$  of normal lobe (size of  $\frac{1}{2}$  or  $\frac{1}{3}$  of distal phalanx) to protect RLN & parathyroid glands ...
- \* **Hemi-thyroidectomy** = excision of one lobe & isthmus, leaving postero-medial part of this lobe ...
- \* **Near-total thyroidectomy** = excision of both lobes & isthmus, leaving just a postero-medial rim of thyroid tissue enough to protect RLN & parathyroids ..
- \* **Total thyroidectomy** = excision of both lobes & isthmus, leaving nothing, but trying to protect RLN, and to preserve at least one parathyroid gland ...

**NB:** If parathyroid glands are removed, one may be "implanted" in sternomastoid .!

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## Indications:

1. Solitary nodule: hemi-thyroidectomy (or enucleation).
2. Simple multinodular goiter: partial thyroidectomy.
3. Toxic goiter (1ry or 2ry): subtotal thyroidectomy.
4. Follicular thyroid carcinoma: near-total thyroidectomy.
5. Papillary & anaplastic carcinoma: total thyroidectomy.
6. Riedel's thyroiditis (with severe pressure symptoms): isthmectomy.

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## Coverings of the thyroid:

*During exposure of "thyroid gland", imagine its coverings:*

- |                                       |   |
|---------------------------------------|---|
| 1. Skin & S.F. (containing platysma). | 2. Investing layer of D.F. of neck.       |
| 3. Pre-tracheal muscles.              | 4. Pre-tracheal fascia (of D.F. of neck). |

These coverings are "incised" to "deliver" the gland into the wound.

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## Blood supply of the thyroid:

*Imagine blood supply to ligate & divide it (devascularization) before excision:*

1. Superior thyroid A & V: enter upper pole of lobes, running with exteroallaryngeal N.
2. Middle thyroid V: enters middle of each lobe.
3. Inferior thyroid V.: enters lower pole of each lobe
4. Inferior thyroid A.: enters lower lateral aspect of each lobe, running with recurrent laryngeal N.
5. Thyroid ima A (in 3 %): enters lower margin of isthmus (to left).

## Subtotal Thyroidectomy

**Anesthesia:** General- Endotracheal.

**Position:** supine with hyper-extended neck.

### Technique:

#### **I- Exposure of thyroid:**

1- Incision: **Low collar incision:**

- 2 fingers above suprasternal notch,
- extending from posterior border of one sternomastoid to the other ...
- \*\* Incision must include skin, S.F. containing platysma as "one flap".

2- Dissection & elevation of flap up to hyoid bone & down to suprasternal notch to expose investing layer of D.F. of neck.

3- Incision of investing layer of D.F. of neck vertically in midline (& separation of it) to expose pre-tracheal muscles.

4- Separation of pre-tracheal muscles in midline to sides, to expose pre-tracheal fascia (closely related to gland).

5- Incision of pre-tracheal fascia in midline & its separation by finger from thyroid (to which it is closely related) - over middle thyroid vein (which is doubly ligated & divided close to internal jugular vein).

6- Separation of gland from the surrounding pre-tracheal fascia by index fingers, to deliver thyroid gland into the wound.

**NB:** Pre-tracheal muscles may be divided in huge nodular, toxic & malignant goitre ... as high as possible near its upper attachment 10 avoid injury of their nerve supply (ansa cervicalis) coming from below.

#### **II- Devascularization of thyroid:**

7- Ligation-division of middle thyroid vein at the middle of the gland close to internal jugular vein. It is better to start by ligation-division of middle thyroid vein, to avoid its avulsion if starting with superior thyroid vessels.

8- Ligation-division of superior thyroid vessels as near as possible to the gland (or even inside its substance), to avoid injury of external laryngeal nerve

9- Ligation-division of inferior thyroid veins at the lower pole of gland (en-mass or separate).

10- Ligation-in-continuity (without division) of inferior thyroid artery, as far as possible from gland, to avoid injury of recurrent laryngeal nerve.

**NB:** Only one side could be ligated in case of simple nodular goitre, while both sides are ligated in toxic & malignant goiters.!

*REPEAT* the same steps on the other lobe.

#### **III- Excision of thyroid:**

11- Separation of isthmus from trachea (kocherization).

12- Apply series of artery forceps (or Kocher's forceps) to catch capsule of gland ..

13- Excision of both lobes & isthmus leaving postero-medial part of each lobe (*its size is according to type of goitre*) to protect RLN & parathyroid glands. Excision is from "lateral to medial",

14- Suturing of capsule of the gland all around to tracheal sheet.

#### **IV- Closure of wound:**

15- Haemostasis by ligation of all bleeders.

16- Putting 2 drains in field bringing them from lateral angles of wound.

17- Closure of D.F. at midline.

18- Approximate pre-tracheal muscles at midline (by few stitches). *If muscles are cut, they are sutured.*

19- Closure of platysma as a separate layer.

20- Closure of skin.

## **Postoperative Care:**

\* In theatre: after extubation, examine vocal cords on table.

\* In the ward: observe for early complications:

1. Bleeding.
2. Dyspnea.
3. Change of voice.
4. Thyrotoxic crisis (high fever, tachycardia, dyspnea, irritability, ..).

\* *Remove drains* after 1-2 days & remove stitches after 4 days.

\* *Before discharge* (leaving hospital): examine vocal cords to exclude RLN injury ...

## **Postoperative Complications:**

### **Early complications:** (first day of operation)

1. Bleeding (reactionary haemorrhage) may compress trachea → suffocation

*Treatment*: immediate opening of wound to ligate bleeders under general anaesthesia ...

2. Dyspnea due to:

- Reactionary haemorrhage. *Treatment*: Re-exploration of wound. ...
- Bilateral incomplete RLN injury. *Treatment*: urgent tracheostomy.
- Laryngeal oedema. *Treatment*: medical. .. or tracheostomy.
- Thyrotoxic heart failure. *Treatment*: Inderal + Digitalis.

3. Change of voice: may be

- Hoarseness of voice = unilateral RLN injury (complete or incomp.).
- Aphonia = bilateral complete R.LN injury.
- Loss of high-pitched voice = external laryngeal nerve injury

4. Thyrotoxic crisis:

= High fever, tachycardia, arrhythmias, dyspnea, irritability & even convulsions ...

*Treatment*: cold compresses + IV fluids with Lugol's iodine drip + Inderal + Hydrocortisone + Largactil.

### **Late complications:** (few days after operation)

5. Hypothyroidism (when no enough thyroid tissue is left).

*Treatment*: L-thyroxine for life.

6. Hypo-parathyroidism (when all parathyroids are removed or their vessels are injured) → cramps few days after operation (tetany).

*Treatment*: -Emergency: 10% calcium gluconate 20 ml slowly IV.

-Maintenance: calcium + vitamin D (orally).

7. Recurrence.

8. Keloid in scar.

9. Progressive exophthalmos following, thyroidectomy for cases of 1ry toxic goiter with exophthalmos that receive antithyroid drugs less than 6 months.

*Treatment*: thyroxine + cortisone + protection of eyes (by sleeping semi-sitting & lateral tarsorrhaphy).

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5- Dissection & ligation-division of cystic artery (CA) as near as possible to gallbladder to avoid injury of right hepatic artery.

6- Separation of GB from its bed: by incision of peritoneum around gallbladder to make it free, then separate it from its bed by blunt dissection starting at its neck.

NB: Closure of gallbladder bed, if possible...

7- Putting a drain in the foramen of Winslow and pass it from a separate stab in the right flank.

**IV-Closure of wound:** in layers...

**Retrograde Cholecystectomy** (Fundus-first cholecystectomy):

Done if difficult exposure of region of CD (triple junction) and only fundus of gall bladder is exposed:

- Clear the field (as before)...
- Catch the fundus gently & separate gall bladder from its bed starting at its fundus, until reaching CD which will be ligated and divided, then continue as before ...

**Post-Operative Care:**

- Observe for complications... - Prevent chest infection: encourage cough & early ambulation...
- Remove drain on 5th day (or when discharge stops).
- Remove stitches on 8<sup>th</sup> day (if Kocher's incision) & on 10<sup>th</sup> day (if right paramedian incision).
- If T-Tube was put, clamp it on 10<sup>th</sup> day & wait for 48 hours:

If fever or colic or jaundice (Charcot's triad) → transtubal cholangiography → to investigate cause of obst.

**Complications of Cholecystectomy**

**I- Operative complications:**

- 1- Injury of CBD → stricture → Obstructive jaundice.
- 2- Injury of right hepatic A. → massive recrosts → liver failure.
- 3- Bleeding from cystic A.

**II- Post-operative complications:**

- 1- Biliary leakage (fistula):

Caused by injury of CBD or CHD, missed stone in CBD with bursting CD stump.

- 2- Obstructive jaundice: caused by obstruction of CBD or CHD by injury, ligation or missed stone.
- 3- Liver failure: caused by massive liver necrosis due to accidental ligation or injury of Rt. hepatic A.
- 4- Post-cholecystectomy syndrome = Persistent symptoms of gallstones - due to:
  - Other diseases as chronic DU or chronic appendicitis (or those of Wilkie's triad or those of Saint's triad) ... (and cholecystectomy was wrongly done) ...
  - Biliary dyskinesia - Ligation or injury of CBD or CHD.
  - Missed stones in CBD or CHD. - Leaving a long cystic duct stump which enlarge causing symptoms.

**Indications of exploration of CBO** (Choledochotomy):

**I- Preoperative indications:**

- History of Charcot's triad (rigors - biliary colic - Jaundice), or history of recurrent pancreatitis.
- IV cholangiogram shows multiple stones in CBD or if US shows dilated CBD or multiple stones in it.

**II- Operative indications:**

- CBD shows stone felt, dilated diameter more than 1cm or aspirated muddy bile (infected).
- Presence of a single faceted stone or if number of stones is less than that in x-ray.

**III- Postoperative indications:**

- Post-cholecystectomy syndrome.
- Biliary fistula.
- Obstructive jaundice.
- If clamping of T-tube (post-operative) → one of Charcot's triad ....

## Laparoscopic Cholecystectomy

**Indications:** the same as in open cholecystectomy...

**Contraindications:**

- **Absolute:** coagulopathy, peritonitis, small intestinal obstruction & large diaphragmatic hernia.
- **Relative:** cirrhosis, acute cholecystitis, pregnancy..

**Room set-up:**

- **Positions** of surgeon, cameraman, 1<sup>st</sup> assistant
- **Sites of trolley** (carrying video monitor, CO<sub>2</sub> insufflator, video set & light source) & another video monitor

**Anaesthesia:** general, endotracheal.

**Position:** supine - with mild reversed Trendlenburg position - with slight rotation to left (right side up) for better visualization of gallbladder region.

**Technique:**

**1- Sub-umbilical incision:** 1 cm horizontal (or vertical) skin incision.

*NB:* Essential need of laparoscopic surgery is to induce pneumo-peritoneum : by insufflation of CO<sub>2</sub> (inert gas) into peritoneal cavity through the Veress needle, then through the port of the camera at the same site.. So, Veress needle should be inserted through the sub-umbilical incision to induce pneumoperitoneum, after which trocar port for camera is inserted through the sub-umbilical incision.

**2- Insertion of Veress needle:**

- Abdominal wall on either side of umbilicus is grasped by surgeon and 1st assistant by towel clips (or by thumb and fingers) to elevate abdominal wall.
- Veress needle is held like a pencil by surgeon who inserts it through linea alba and peritoneum where a characteristic popping sensation is felt.
- Test the (latency of needle by saline irrigation in & out of peritoneal space, where it should give free flow.
- If no free flow, Veress needle may be removed and reinserted. Generally, if insertion is difficult, it is safer to convert it to open mini-laparotomy with a peritoneal purse-string suture secured to the port.

**3- Induction of pneumo-peritoneum:**

Tube for CO<sub>2</sub> insufflation is connected to Veress needle to induce pneumo-peritoneum, which begins with a low flow with low pressure (5-7 cm water), then flow rate may be increased up to 15 cm water. Once 1-2 litres of CO<sub>2</sub> are in, abdomen becomes hyper-resonant, but 3-4 litres of CO<sub>2</sub> are needed to fully inflate abdomen & Veress needle is removed.

**4- Insertion of trocar port for camera:**

- After grasping either side of umbilicus, a 10-mm trocar port is inserted with a twisting motion, aiming towards pelvis giving a characteristic popping sensation as the trocar enters peritoneal space. Trocar is removed and the escape of free CO<sub>2</sub> gas is verified.
- CO<sub>2</sub> source is attached to this port and videoscope with its sterile light source cord and cover is inserted.
- Exploration for intra-abdominal organs pathology or adhesions and also for any trocar-related visceral or blood vessels injuries (mediate open laparotomy for repair is done)

**5- Insertion of 3 additional trocar ports:** Under direct vision of their intra-abdominal penetration:

- 10 mm trocar port in epigastrium 5 cm below xiphoid (with its intra-abdominal entrance just to right of falciform ligament).
- 5 mm trocar port in right upper quadrant near mid-clavicular line many cms below costal margin.
- 5 mm trocar port more lateral at level of umbilicus.

*NB:* These sites may be modified according to anatomy of patient & experience of patient

*NB:* Patient is placed in reversed Trendlenburg position (10-15 degrees) & right side up for better visualization of gallbladder region.

- 6- Grasping of fundus of gallbladder** with a racheted forceps through lateral port, then gallbladder & liver are lifted superiorly to give good exposure of undersurface of liver & GB.
- 7- Gentle removal (teasing) of omental** & other loose adhesions from GB.
- 8- Grasping of infundibulum of GB** with forceps through middle port - for lateral traction to expose cystic duct & artery (CD & CA).
- 9- Opening of peritoneum over triple junction** to expose of CD & CA with forceps through epigastric port by gentle teasing and spreading motions ....
- 10- Circumferential exposure of CD & of CA:** with forceps through epigastric port by spreading motions..
- 11- Circumferential clearing of CD (for 2 cm) & of CA (for 1 cm):** with a hook swept back and forth.  
*NB:* Magnification is controlled by the closeness of videoscope to dissection site. At this point, if dissection is difficult because of inflammatory swelling and scarring, the surgeon should consider conversion to open surgery ... !
- 12- Doubly securing of CA with metal clips** i.e. application of metal clips both proximally & distally using a clip applier.
- 13- Division of secured CA between applied metal clips** using an endoscopic heavy scissors.
- 14- Doubly securing of CD with metal clips** i.e., application of metal clips both proximally & distally using clip applier as high as possible on CD where it begins to dilate and form GB.
- 15- Division of secured CA between applied metal clips** using endoscopic heavy scissors.
- 16- Grasping of GB at its junction to CD with forceps** through middle port to remove GB from its bed in a retrograde manner.
- 17- Scoring lateral peritoneum** with diathermy for one cm or so.
- 18- Elevation of GB from liver bed**, with appropriate traction & dissection with diathermy ...  
*NB:* Vigorous traction or dissection into GB wall may produce an opening with spillage of bile & stones. This opening is secured using forceps, metal clips or 8 suture loop ...
- 19- Haemostasis of GB bed** by saline irrigation with aspiration of bile and blood from lateral gutter just over the edge of the liver.
- 20- Division of final peritoneal attachments** of GB from liver. GB is positioned above liver, which has now fallen back inferiorly to its normal position.
- 21- Removal of videoscope** from umbilical port to be inserted in epigastric one.  
 Grasping forceps is passed through umbilical port to pick up GB specimen in region of CD.
- If stones are small, it is easy to withdraw GB, forceps & umbilical port back out to level of skin where GB is grasped with a clamp. Bile & small stones may be easily aspirated whereupon GB will exit easily through umbilical site under vision of videoscope in epigastric port.
  - Large or medium-sized stones may require crushing before extraction or may require enlargement of linea alba opening.
- After extraction, umbilical site is temporarily occluded with finger to maintain pneumoperitoneum. Videoscope is removed and pneumoperitoneum is evacuated to lessen postoperative discomfort.
- 22- Closure:**
- Port sites are infiltrated with local anaesthetic.
  - Fascia is re-sutured with absorbable sutures.
  - Skin is approximated with absorbable s.c. sutures.

# APPENDICECTOMY

## **Indications:**

- 1- Acute appendicitis (uncomplicated or complicated with peritonitis) needs "Emergency Appendicectomy".  
If complicated with "appendicular mass", it needs "Delayed Appendicectomy".
  - 2- Subacute or chronic appendicitis.
  - 3- Appendicular dyspepsia (chronic appendicitis.).
  - 4- Mucocoe of appendix
  - 5- Carcinoid of appendix.
- NB.** Carcinoma of appendix needs "right hemicolectomy".

## **Anatomy of Right Iliac Fossa:**

I- During exposure of Cecum and appendix, *imagine the layers of anterior abdominal wall:*

- 1- Skin and S.F.
- 2- External oblique aponeurosis (its fibres run downwards medially).
- 3- Internal oblique and transversus abd. muscles - close to each other (their fibres run perpendicular to those of external oblique).

**N.B.** Fascia transversalis is adherent to transversus abdominis.

- 4- Peritoneum.
- 5- Caecum and appendix.

II- After exposure of caecum and appendix, imagine:

- Blood Supply of Appendix:

Appendicular A. runs in free border or mesoappendix. Since this artery cannot be dissected, all the mesoappendix must be ligated to devascularize appendix to be excised after that

- Position of Appendix: (Not constant)

- |                               |                              |                              |
|-------------------------------|------------------------------|------------------------------|
| 1. Commonly Retro-caecal. 70% | 2. Less commonly Pelvic. 20% | 3. Rarely Pre-ileal.         |
| 4. Rarely Post-ileal.         | 5. Rarely Para-caecal.       | 6. Occasionally Sub-hepatic. |

## **Classical Appendicectomy:**

**Anaesthesia:** general or spinal.

**Position:** Supine.

## **Technique:**

*\*Examine under anaesthesia to detect "Appendicular mass" (if present!)*

### **I- Exposure of caecum and appendix:**

1. Mc-Burney's incision: 5 cm long incision, perpendicular to a line joining anterior superior iliac spine to umbilicus, over a point at the junction of lateral  $\frac{1}{3}$  with medial  $\frac{2}{3}$  of the line. Incision is deepened to expose external oblique aponeurosis. McBurney's or Grid-iron is "Muscle Split".
2. Incision of ext. oblique aponeurosis in the same direction as skin incision.
3. Separation of internal oblique and transversus abdominis muscle fibers in a direction perpendicular to above incision.
4. Pulling then incision of the peritoneum, in same direction as skin incision.
5. Identification and delivery of caecum (by its taenia coli and appendices epiploicae). If caecum is fixed (difficult delivery) it is mobilized by dividing peritoneum laterally & inferiorly (Kocherization)
6. Reaching and delivery of the appendix (by following of taenia coli of caecum).

NB: Lanz incision may be used.

NB: Lower right paramedian incision may be used as an "exploratory incision".

### **II- Devascularization of appendix:**

7. Holding mesoappendix near the tip of appendix.
8. Division and ligation of mesoappendix between 2 artery forceps.



### **III- Excision of appendix:**

9. Crushing of base of appendix using a Kocher's forceps: to crush lymphoid tissue in wall of appendix and to avoid slipping of ligation...

10. Ligation of crushed base of appendix. (If inflamed base, no crushing is done).

11. A purse-string seromuscular suture on wall of caecum around base of appendix.

12. Division of appendix 2 cm distal to ligature (stump is carbolicised or painted with tincture iodine or alcohol).

13. Invagination of stump and tying of the purse-string over it. (if oedematous caecum, No purse-string is done).

14. Ensure hemostasis and peritoneal toilet is done.

### **IV- Closure of wound: (in layers)**

15. Closure of peritoneum.

16. Approximation of int. oblique and trans. abdominis.

17. Closure of Ext. oblique aponeurosis.

18. Closure of skin.

\*No drain is put (except if there is peritonitis ....)

### **Special Problems:**

1. If oedematous caecum: stump of appendix is NOT invaginated but only ligated and diathermized.

2. If oedematous (infected) base of appendix: it is NOT crushed but only ligated.

3. If gangrenous base of appendix: it is NOT crushed or ligated, but 2 arteries or more are applied to caecal wall close to it and tied after removal of appendix, then a second seromuscular layer is applied.

### **Retrograde Appendicectomy:**

It is done when appendix is fixed in its place by adhesions and cannot be delivered into wound. In such cases, "Devascularization and Excision" is done as follows:

1. Base of appendix is identified (its apex is adherent deeply)

2. Artery forceps is passed through mesoappendix near base appendix.

3. Crushing of base, ligation and division (stump is carbolicised).

4. A purse-string suture around base, and invagination of stump.

5. Piece-meal division and ligation of the mesoappendix starting proximally to distally ...

Then appendix is removed.

### **Complications of Appendicectomy:**

#### **I- Early:**

1. Paralytic ileus

2. Faecal fistula (from bursting of the stump) due to:

-Wrong diagnosis e.g. appendicectomy in chronic disease.

-Wrong technique e.g. bad closure of appendicular stump.

3. Infections: iliac, pelvic or subphrenic abscesses, or Portal pyaemia.

#### **II- Late:**

1. Adhesive intestinal obstruction (common).

2. Incisional hernia (from infection or a large muscle-cutting incision).

3. Right direct inguinal hernia (from cutting of ilioinguinal n. in case of low Mc-Burney's incision ...).

**NB:** Non-specific complications occurring in any operation may occur:

Shock, Haemorrhage, Infection, Pulmonary complications or D.V.T.

# REPAIR OF INGUINAL HERNIA

## 3 Types of Operations:

- **Herniotomy** = excision of the sac.
- **Herniorrhaphy** = repair of the defect (in posterior wall of inguinal canal)..
- **Hernioplasty** = putting a graft over the defect (in posterior wall of inguinal canal).

## Anatomy of Inguinal Canal & Region:

I- To expose hernia sac, imagine layers of anterior abdominal wall at the inguinal region (anterior wall of inguinal canal):      1- Skin and S.F.                      2- External oblique aponeurosis.

II- Hernial sac indirect inguinal hernia is one of the contents of spermatic cord so, to expose it, imagine the coverings of spermatic cord in inguinal canal to incise them:

- 1- Cremasteric muscle-fascia (outside).              2- Internal spermatic fascia (Inside).

Then, the sac must be separated gently from other contents of cord.

Hernia sac in direct inguinal hernia is Not related to spermatic cord, but it is only a defect in Hasselbach's triangle. So, to expose it, imagine the posterior wall of inguinal canal which is nothing but a layer of fascia transversalis covering the sac.

After exposure of sac, Herniotomy is done.

III- After herniotomy, repair the defect (from which the sac protrudes) in posterior wall of inguinal canal which is "fascia transversalis":

- Defect in indirect inguinal hernia is the wide "*deep ring*" while defect in direct inguinal hernia is the weak are of "*Hasselbach's triangle*" in the fascia transversalis. In the former, fascia transversalis is plicated around deep ring and in the latter, fascia transversalis is plicated in the Hasselbach's triangle ... which is the essential part of repair.
- Weak abdominal muscles are compensated for by a "*Repair*" e.g. obliteration of inguinal canal itself by approximation of its roof (conjoint tendon) to its floor (inguinal ligament) → *Bassini's repair*. Both indirect and direct hernia → Herniorrhaphy. However, skin, synthetic tents or fascia lata may be used to close the defect → Hernioplasty.

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## **Repair of Indirect Inguinal Hernia**

Anesthesia: general or spinal or local.

Position: Supine.

### Technique:

#### **I- Exposure of Sac:**

1. Inguinal incision: one finger-breadth above and parallel to medial  $\frac{2}{3}$  of inguinal ligament. Incision is deepened to expose ext. oblique aponeurosis.

2. Incision in ext. oblique aponeurosis in the same direction and length as skin incision, until splitting the superficial ring to expose the cord.

Retract external oblique aponeurosis to outside to expose "inguinal canal"....

Protect "ilioinguinal nerve"....

3. Delivery of the cord by fingers and hanging it by "Ring forceps" or "gauze".

4. Incision of coverings of the cord longitudinally to expose the sac (2 layers). Sac is identified by: poorly white colour, definite edges, crescentic fundus and by lying anterolateral to vas and vessels.

5. Dissection of sac up to its neck. Neck is identified by: being narrowest part, surrounded by dense extraperitoneal fat and being immediately lateral to inferior epigastric vessels.

## **II- Herniotomy:**

6. Opening sac at its fundus and explore its contents: it may be adherent intestine (separated and returned to abdomen) or adherent omentum (excised) or sliding hernia may be present .....

7. Transfixion ligation of neck of sac, followed by excision leaving 1 cm stump. (Transfixion must be done under vision).

## **III- Herniorrhaphy:**

8. Plication of fascia transversalis = Narrowing deep ring so that its size allow tip of little finger beside the cord + tightening of whole length of fascia transversalis (using non-absorbable sutures).

9. Bassini's Repair: suturing conjoint tendon to inguinal ligament behind the cord (using non-absorbable sutures).

NB: Other methods of repair may be used instead (see text ....).

## **IV Closure of the wound:**

10. Return cord to its place and close its coverings (Re-skeletonization)

11. Close external oblique aponeurosis until superficial ring which must be narrowed so that its size allows tip of little finger beside the cord.

12. Close S.F. and skin.

## ***Operation for Congenital Inguinal Hernia:***

- Incision: in lower abdominal crease (transverse).

- Ext. oblique aponeurosis s NOT OPENED, but cord is exposed directly by incision and sac is dissected and excised. This is because the ext. & int. inguinal rings lie opposite to each other and inguinal canal is underdeveloped.

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## **Repair of Direct Inguinal Hernia**

**I- Exposure of the Sac:** the same as indirect hernia except that the sac lies behind cord (and Not passing through it). Cord is just elevated to show the sac behind the posterior wall of inguinal canal → always medial to inferior epigastric vessels.

## **II- Herniotomy:**

Neck of sac is usually wide so that transfixion is impossible. If sac is large, it may be opened and then closed by continuous sutures. If sac is small, sac is only invaginated (Not opened) and fascia trasversalis is repaired (plicated) over it.

**III- Herniorrhaphy:** the same as indirect hernia:

- Plication of fascia transversalis over the sac only is essential.

- Bassini's repair ...(or Bloodgood or Halsted's repair).

NB: Herinoplasty may be done.

**IV- Closure of wound:** the same as indirect hernia.

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## **Repair of Pantaloon Hernia** (Double hernia = indirect + direct):

Surgeon pulls on indirect sac until direct sac disappears and then it is repaired as an indirect hernia ...

## **Bloodgood Repair:**

A triangular flap from lower part of rectus sheath s hinged on its lateral border and sutured to inguinal ligament behind cord.

## **Halsted's Repair:**

The same as Bassini's repair but the external oblique aponeurosis is closed behind cord so tat the cord becomes subcutaneous.

## **Hernioplasty:** (Best is skin graft)

I- Autografts: -Darning by strips of fascia lata or ext. oblique aponeurosis.

-Patching by patch of fascia lata or skin graft.

II- Artificial Grafts: -Darning by thick threads of silk, nylon, stainless steel,.....

-As a mesh by proline, tantalum or Dacron meshes, ...

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## **Variations in Techniques in Strangulated Indirect Inguinal Hernia:**

1. Incision is inguino-scrotal → good exposure.

2. Incision of ext. obl. aponeurosis is without opening of superficial ring (may be the strangulating factor)

3. On opening fundus of sac, fluid content is sucked out (= clearing contents of sac).

4. Constricting ring is divided cautiously (= to protect strangulated intestine:

5. Determine viability of intestine:

-Viable intestine is returned back.

-But non-viable intestine (gangrenous) is resected with anastomosis (see text ....).

6. Repair may or may not be done (= oedematous tissue....)

7. Drainage of wound on closure is essential because tissues are contaminated or when resection-anastomosis is done.

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## **Post-operative complications of Repair of Inguinal Hernias:**

1. Haematoma (due to imperfect haemostasis)

*Treatment*: open the wound to evacuate hematoma.

2. Infection: (due to haematoma or seroma, rough handling of tissues).

*Treatment*: open wound to drain pus.

3. Hydrocele (due to tight deep or superficial rings around cord).

*Treatment*: Early cases: scrotal elevation + pressure bandage.

Established cases: Eversion of tunica or Lord's operation.

4. Recurrence:

*Causes*:

- Preoperative: Huge hernia, untreated causes of high I.A.P. or weak muscles.

- Operative: missed rules of hernia surgery, or insufficient repair ....

- Postoperative: hematoma, infection, distension or rapid return to work.

*Treatment*: Herniorrhaphy & Hernioplasty depending on age, occupation, size of hernia, condition of muscles

5. Injury of important structures during dissection of sac:

- Injury of cord structures or their compression at int. or ext. ring, which may cause:

• Testicular atrophy    • Hydrocele

• Painful mass of thrombosed pampiniform plexus of veins.

- Injury of "urinary bladder" if sliding in a hernia. This is dealt with by its closure in 2 layers + its drainage by a "catheter" for 4-5 days + drainage of the wound.

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